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# REPORT

UPON

## CERTAIN EPIDEMIC OUTBREAKS OF ENTERIC FEVER,

IN APRIL, 1880,

BY

THE MEDICAL OFFICER OF HEALTH OF GLASGOW.

WITH APPENDED CORRESPONDENCE, &c.

GLASGOW

PUBLISHED BY ROBERT ANDERSON, 22 ANN STREET

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I SHALL preface my detailed analysis of the late epidemic, or rather cluster of epidemics, of enteric fever in Glasgow, by a historic narrative of the facts as they presented themselves in the preventive treatment of the epidemic by the Sanitary department. A distinct interest belongs to the two methods of dealing with the event. The slowly and laboriously accumulated evidence, which is massed in the order of an argument in the second portion of this Report, was anticipated in the action taken (as it must be to have practical effect), on the spur of the moment, after a rapid survey of the situation. Besides, certain unexpected and unnecessary difficulties were thrown in the way of the preliminary inquiry, of which it is necessary that the public should be made aware.

Upon returning to the office on Saturday, 24th April, as the staff were leaving for the day (2 p.m. on Saturdays), I was informed by Mr. Macleod that Dr. Lapraik had called to report that on the previous day and that forenoon he had seen several patients in North Hanover Street, Cathedral Street, John Street, North Frederick Street, and Little Hamilton Street, who were suffering from gastric derangement with febrile symptoms. He apprehended enteric fever, and had ascertained that *all* were supplied with milk from the same dairy—viz., Dairy 1 C. (see List in Appendix). Orders were at once issued for a house-to-house visitation in these streets on Monday morning, 26th April. The result

was to confirm and extend Dr. Lapraik's information. There was a contemporaneous crop of cases of febrile disease amongst the customers of this dairy. Several other practitioners had been summoned to such cases in their practice, and as they were not agreed in their ideas as to the precise nature of the ailment, some ascribing it to influenza, others to gastric irritation of the nature of diarrhoea, I made a hurried run through the cases in Little Hamilton Street, and satisfied myself that with those cases which were still indefinite in their character others were associated which were examples of typical enteric fever. All were customers of —'s dairy. In our experience, the ordinary chronic causes of this fever, connected with derangements of drainage, never produce contemporary crops over an extended area, but only erratic cases. One of those isolated cases had occurred in the middle of February in North Frederick Street, and had been made the occasion of the customary house-to-house visitation through those very streets in the latter half of that month, the records of which showed an entire absence of disease at that date in the same houses which were now simultaneously invaded. Besides, this dairy did not monopolize the milk supply of the district. On the contrary, in High John Street, exactly opposite the east end of Little Hamilton Street, there was Hamilton's dairy, which was much more conspicuous, and did an enormous wholesale and retail business, yet none of the affected persons were customers of this dairy.

On inspecting —'s establishment, I found it scrupulously clean, conducted by Mr. —, his wife, a grown-up daughter, and a maid, who were in good health. They sold the product of 8 cows kept in a byre behind the tenement, with an added supply derived from Mr. C— (Dairy 22 N. in List). In the house of a son-in-law of Mr. —'s in the flat above the dairy, I found a child who had sickened *within the same period as the customers*. No doctor had been summoned, but the case was to my eye one of incipient enteric fever. This family was supplied only with C—'s milk, the product of the cows being, as usual in towns, in great

demand, and therefore reserved for regular customers. I had observed that the other cases all got milk at a time when most probably C——'s milk alone was on sale, the home milk being sold, mostly delivered at the premises of customers, warm as soon as milked. The suspicious portion of the milk which Mr. —— distributed was therefore that derived from Mr. C——. In the afternoon, when receiving the ordinary reports of the Epidemic Inspectors, information was brought in of cases of enteric fever in other parts of the town, north of the Clyde, and one of the men had heard that there was a severe outbreak at Possilpark. I ordered Mr. Armstrong, the Dairy Inspector for the western district, to call upon Mr. C——, with verbal instructions to inform him of the suspicion attaching to his milk, and to request a list of the farms from which he obtained his supply. This he did on the evening of the 26th April, but failed to see him. Next morning about nine o'clock he saw him, but Mr. C—— refused to give me any information unless I promised not to publish names or otherwise act so as to injure his business. He would meet me at the office of his agents, Messrs. ——— ———, at four o'clock, and would then, in the event of satisfactory conditions being accepted, give me the information asked. The attitude thus assumed by Mr. C—— seemed to me so utterly inexcusable, and likely to be so serious in its results, that I thought it injudicious to enter upon verbal negotiations, with the intervention of agents, which would leave no evidence which could, if need were, be published. I accordingly wrote at once to Mr. C——, stating the circumstances under which I made the request for a list of his farmers, objecting to conditions, and declaring formally that, as Medical Officer of Health for Glasgow, I found it was essential for the performance of my duties that I should immediately be informed of the names and addresses of the persons whose milk he, as agent, forwarded to Mr. ——, at any time since the 1st of March last. I gave him until 10 a.m. next morning (28th April) to comply, and concluded—"Failing the reception of that information before that hour, I shall hold myself at

liberty to send a copy of this letter to the newspapers, or otherwise to bring your attitude, in reference to the health and life of the public, to the bar of public opinion." \* Between 4 and 5 in the afternoon of the 27th, a letter was received from Messrs. ——————, expressing surprise at the tone of my letter, as on a former occasion I had agreed to suppress his name in a similar investigation, stating that his wish was only to protect his own interests, and that on receiving this assurance, and on condition (1) that whoever might be employed on behalf of the Authorities to conduct the investigation would report to them, as agents for Mr. C——, from time to time the result of their inquiries, and (2) that should their client request any further investigation to be instituted, such should be undertaken by the Sanitary Staff, they were quite prepared at once to give me the list of farmers. On the forenoon of the 28th, I replied that on the former occasion Mr. C—— had received from me verbally that which I now gave in writing—the assurance in general terms that his interests would be respected by me so far as my duty to the public permitted. I claimed the information in the interests of the public, but pointed out that it was even more for his interest, as suspicion *now* lay at his door and could only be removed by my inquiry, and that Mr. C—— had taken upon himself the responsibility of wilfully causing a delay of nearly two days in an investigation in which, if the circumstances at all resembled those of the Hillhead outbreak, every hour lost meant injury to the public health. I refused to make any report of progress to them, as agents, but was willing to follow out any line of inquiry which they might suggest as likely to advantage their client, although I thought it unlikely that any essential part of my case would be overlooked. This letter was delivered by Mr. Armstrong, with instructions to wait an answer. He obtained a list of all the farmers who had sent Mr. C—— milk since 1st March,

\* In reference to this correspondence, while in the text I give such an abstract of it as to make a coherent narrative, that there may be no raising of questions as to its terms, I give it *ad longum* in the Appendix.

indicating three as the source of the morning and five of the forenoon supply sent on to — ; but the agents added—“ *It is, however, quite possible that — may have got the milk of the other farmers.*”

We have now got to the afternoon of Wednesday, the 28th April. In the morning, after his unsuccessful interview with Mr. C—, Inspector Armstrong went out to Possilpark to ascertain the state of things and inquire as to the milk supply. He found that a severe epidemic of enteric fever did prevail there, and that several dairies in the locality were supplied by Mr. C—. On Tuesday I had made out that Dairy 9 N., Possil Road, and Dairy 1 N., Springburn Road, which were associated with cases of enteric fever reported in their neighbourhood, also received a supply from C—. When I read the agents' statement that it was quite possible that — might have got the milk of the other farmers, I saw that the same statement must apply to all their client's retailing customers; and this association of outbreaks of fever, widely separate, as to locality, but apparently coincident in time, convinced me that one or other of the farmers was contributing infected milk to the stock of Mr. C—'s trade, and that wherever any portion of this stock went we might have fever, as in the case of —'s Dairy.

The most pressing object was to discover this farm. On examining the list I found it contained thirty names, widely scattered—as Biggar, Dumfries, Dunragit, Gartness, the places most distant, will show. Though the outbreak to be accounted for was now not only that attached to —'s supply, still the scent seemed to be hottest in that direction, and there was just time on the afternoon of the 28th, by train and driving, to ascertain the state of the three farms definitely stated as the source of —'s morning supply—viz., Wellflat, by Kirkintilloch; Blochairn, by Milngavie; and Carbethi Guthrie, by Strathblane. No suspicion was found to attach to any of these farms. The other farms were made out in itinerary lists according to locality, which were put in the hands of inspectors, with instructions to start on the 29th by the first trains.

The first farm on Mr. Inglis' list was situated near a station on the Forth and Clyde Railway. There he was told that a child had had "infantile fever," and a dairymaid was presently recovering from "childbed fever." He got back to town to report in time to permit of my return with him for a personal inquiry. The child, aged five, was pale and debilitated. "Infantile fever" is accepted as another name for enteric fever in a child. The dairymaid had not sickened of her present ailment until nearly seven weeks after her confinement of an illegitimate child—an interval which, to the best of my knowledge, was inconsistent with the reference of a febrile illness to the puerperal condition, which was implied in its description as puerperal or childbed fever. She was then quite non-febrile, but suffering from extensive bed sores. She had fallen ill on 12th, the child on 25th March. The outbreak in Glasgow seemed to have begun about the middle of April. In view of all the circumstances, my opinion was that she had had enteric fever, which was communicated to the child, and that this was the source of the contamination of Mr. C—'s stock of milk. The internal structure of the farmhouse and the general arrangements of the steading were such as to leave no room for doubt as to the probability, much less the possibility, of such being the career of the contagium of enteric fever when introduced into the family. I therefore felt justified in requesting the farmer to send no more milk into Glasgow, which he readily agreed to. The last consignment was made on the previous morning (28th April). Coming to town about 9 o'clock, I wired the information to Mr. C—. On the 28th I had informed Mr. Beattie, of the Barony Parish, of the relation of the milk supply associated with the Glasgow outbreaks to the Possilpark outbreak, with which his Board, as Local Authority has to deal. It was a gratification to me to learn that Dr. Christie had been instructed to investigate that epidemic, as it not only insured a thorough inquiry, but rendered that co-operation which was necessary both certain and cordial. I informed him of the discovery the same night.

It is unnecessary to pursue the historic method further than to say that, though satisfied this was the source of the infection, the inspectors continued their visitation of the remaining farms, which they completed in a few days, without finding anything to cause suspicion as to any other.

Before entering upon the analysis and detailed statement of the facts of this epidemic, it may be well to say in general, that the greatest care has been taken in their collection, so as to make them complete, and in their verification, so as to ensure their accuracy. I must gratefully acknowledge the intelligent labours of Mr. Macleod and his staff, without which, cheerfully rendered and discriminately exercised under great pressure, my own efforts would have been useless. No case has been registered as fever without the certainty that it was so diagnosed either by a private practitioner or by myself. Every case thus verified has been recorded. Surrounding many indubitable cases of enteric fever there have been cases of allied sickness of a kind not found except in this association, which I have no doubt had the same specific origin. These have not been registered, though, as regards the propagation of the contagium, they are probably among the most dangerous and efficient agents, being disregarded and uncontrolled. All information as to milk supply was obtained from the heads of families, and details ascertained as to the kind of milk (sweet, skim, cream, sour), and the place, hour, and mode of getting it. Owing to the nature of the inquiry—which concerned the milk of an agent whose name was unknown in the locality, but to the persons interrogated referred only to the shop or dairy with which they dealt—the answers must be held to be entirely free of suspicion of adaptation, if indeed we could entertain any such suggestion in any case as possessed of the slightest show of reason. The invariable tendency of all such investigations is in favour of the offending milk—*i.e.*, it is quite certain that every case of enteric fever recorded against it actually had the chance of imbibing it, but it is equally certain that every case which had this chance cannot be recorded, because of the want of

evidence. People do not live in view of a scientific inquiry being at some future day made into all their domestic habits, their casual shoppings, and ordinary eatings and drinkings. This is especially true of the class of people among whom this epidemic chiefly prevailed—living for the most part in small houses, running no accounts, purchasing in small quantities, sending for their goods, using their children as their messengers. Consequently, if you have a poisoned article put on sale in a city, and especially if that article be one which must be got from day to day, and is in humble households sent for when required, you must expect that its effects will manifest themselves in unexpected quarters, that all the proof which can be produced of the source of the poison will in many cases be the presumptive evidence that *there* is the poison to be got for the asking, and *there* in convenient proximity is a person suffering from the effects of such a poison. I therefore claim the fact that here and there contemporary cases of enteric fever have occurred in families living hard by a suspected dairy, while they get their habitual supply elsewhere, and are therefore not put against that dairy, as one of the strongest arguments in favour of the alleged origin of this epidemic.

This brings me to another preliminary remark. It is well, before beginning a proof, to have clear conceptions of what facts our proof is required to cover. It is a common error, if it be not a favourite device, of opponents in a scientific controversy, to insist upon branches of evidence which are not essentials, but merely afford an opportunity of disparaging an argument by pointing to supposed defects in its scope. It is also necessary to be clear as to the terms we employ.

First, as to terms, it is not, in the scientific sense, the *cause* of enteric fever for which I am in search. There is only one cause of enteric fever, and that is the specific, particulate contagium or seed. It is only the medium or channel by which this contagium was, in this special instance, distributed which I have to discover. That medium may be spoken of as the cause of the epidemic, viewing it as a distinct struc-

ture; and, for convenience, milk or any other medium may be referred to as the cause of enteric fever, but not with scientific accuracy. Obviously, therefore, no mystery need be made of the designation of milk as the cause of enteric fever. It is the innocent medium for the casual conveyance of the specific contagium or seed—the true cause. Therefore, milk in general is not to be expected to impart fever, because milk in particular is known to do so; and it must not be argued that, because milk in general does not impart fever, therefore milk in particular cannot.

Next, as to the scope of my proof. It follows as a corollary to the preceding proposition that milk is only a medium for the conveyance of the contagium, that there may be others, and that the action of milk does not imply that these other media are put in abeyance. Enteric fever is never absent from Glasgow, propagated intermittently by its diverse chronic media. These have been continuously active, before, and during, and since this epidemic. Therefore, besides that fringe of associated cases, really originating in, but not traceable to this epidemic, to which I have alluded, there must be an intermingled series of dissociated, erratic cases, having nothing to do with the milk supply, being simply the normal sporadic offspring of our chronic media. These are included in the area of the epidemic outburst like the fossil products of an old in the fresh deposits of a new formation. These I am not required to account for. Their existence is no argument against the milk theory. What I have to account for is a crop of cases springing up in certain areas with a certain symmetry as to time. These other cases occurred indifferently over the whole area of the city, and have no symmetry or coincidence as to time, except such as is derived from the inevitable intermingling of a sprinkling of the associated cases to which I have referred, whose very presence is a strong argument for the existence of the special circumstances in which the true epidemic originated.

Finally, I must also remark that, whatever may be said, milk is an established medium for the dissemination of

enteric fever, recognized by the Legislature, beyond the region of discussion as a *vera causa*, and therefore I shall not waste your time over the elaboration of features of this outbreak which are common to many outbreaks of the same kind which are on record, or expand details, as in the case of a previously unheard-of event it would be necessary to do.

For reasons which will be apparent in the sequel, I go back in the statistics of enteric fever to 1st April, and come down to the latest date—viz., Saturday, 29th May. The record of deaths possesses more value than that of cases, because it is certainly complete. Every death attributed to enteric fever is known. Taking the date of the occurrence of death, not the date of registration, I find that in all Glasgow, from 1st April, there were 69 deaths of inhabitants (exclusive of persons belonging to Possilpark, who died in Belvidere). In March, there were only 11 deaths. In those districts of the city lying north of the Clyde, there were 62 deaths; in those lying south, only 7. Taking those as the product of two months, this represents a death-rate per 100,000 inhabitants of 88 for the north, and 35 for the south, and brings out the most general territorial limitation of the epidemic. It was confined to the north of the Clyde, and Mr. C— sends no milk to the south of the river. I shall therefore speak only of the northern districts. During the same period there were registered in the books of the department against this portion of the city, 508 cases, occurring in 372 families. During the month of March there were only 37 cases in 31 families. Spring is the season of minimum prevalence of enteric fever, so that such an outbreak was entirely abnormal.

If we take as the basis of a classification of these 508 infected persons the origin of their milk supply, and arrange them in two classes—those supplied from dairies or shops which retail milk wholly or partly obtained from C—, and those from dairies or shops which retail the milk of other agents, we find 373 cases and 257 families in the former class, and 135 cases and 115 families in the latter—that is to say, 73 per cent. of the cases, and 69 per cent. of the families, were

customers of the suspected dairies. Similarly classifying the deaths registered in the northern districts, we find 36 related to the suspected dairies, and 26 to those not suspected—*i.e.*, 58 per cent. of all persons who died of enteric fever since 1st April were customers of Mr. C.'s shops. We have here the first glimpse of relationship shown in a rough way. Let us apply the tests of time and locality to the two classes.

The date of sickening is of prime importance in all specific diseases, because it marks the springing into activity of the specific contagium or seed, and enables us to approximate to the still more important date of the implanting of the contagium in the body. In searching for the medium of conveyance of the seed, of course, we are able at once also to ascertain in each case whether it is possible that the medium could have so acted. If the person sickened before the medium was infected, then no such conveyance could have taken place. The first of the 373 customers of C—'s shops sickened on 9th April, and, day by day, a few more or a few less, they sickened in numbers—on the whole increasing, until the maximum of 38 was reached on 23rd April, after which date the numbers fell with similar fluctuations, the last of which was to 10 on the 4th May, tapering off, until, in the last fortnight, a few secondary cases have appeared in houses where the first persons affected were treated at home. This symmetry of structure will appear from the weekly numbers. In week ending 10th April, 2; ending 17th, 42; ending 24th, 151; ending 1st May, 123; ending 8th, 33; ending 15th, 12; ending 22nd, 4; ending 29th, 6. When we turn to the 135 customers of the miscellaneous dairies, we at once are made aware that we have passed from the sphere of one cause to the region of many—from uniformity to chance and accident. The first sickened on 3rd March, and, day by day, with occasional blanks thereafter, they fell ill by ones and twos and threes, sometimes reaching six and seven. This asymmetry will appear from a few weekly numbers, parallel to those given above. In week ending 10th April, 11; ending 17th, 11; ending 24th, 24; ending 1st May, 23; ending 8th, 19;

ending 15th, 10; and so on. You will observe, however, that there is a decided increase in those cases coincident with the acme of the epidemic. Familiar as I am with the position and circumstances of each case, and aware of the chance detection of relationships with infected dairies which have transferred other unassociated cases into the list of the associated, I have no doubt this is evidence of the truth of what I already said that, given a poisoned article of food for sale, and many more will be poisoned than can ever be traced. For example, among the unassociated cases there are two young men, who were clerks out at Possilpark, who sickened at the very height of the epidemic; there is also a young wife, who frequently visited her mother, living in Little Hamilton Street, where, on one occasion for certain, she drank milk from Dairy 1 C. Until the fact was discovered, there was also among the unassociated a grocer's assistant, who daily washed down his lunch with a tumbler of milk bought at an infected dairy, though his home-supply was from a pure source.

Returning to the 373 symmetrical cases, let me ask your attention to this rough diagram, the black columns in which indicate, by the relative proportion of their height, the number who sickened each day. You observe how gradually they rise to an acme, and then dwindle away. Remember, the dissemination of the specific contagia is strictly analogous to the sowing of seed. If it were possible to note the appearance above ground, day by day, of the green blade from each individual seed, late or early, as it had been favoured or kept back by the little circumstances of its position in the soil, and if you made a diagram to represent the result, it would bear exactly this aspect. There is no possibility of keeping out of the mind, as we look at the fever diagram, the conclusion that it exhibits the fruit of an act or acts of sowing broadcast of the fever seeds among the population whose sickness is there depicted. Where shall we find the medium which was in contact with all, and might therefore convey those seeds? Air, water, sewers, drains; all are either too wide or too narrow. (See Fever Calendar, facing p. 26.)

This will become more obvious when we consider the local distribution of this epidemic. On 8th May, after we had formed, under the guidance of the fever which surrounded them, a long list of shops supplied by Mr. C——, I wrote to his agent asking a list of all the shops so supplied, which I received three days after. We found, on comparing this with the office list, that there were only a few which we did not already know, that there was one omitted from the agent's list which was correctly (as was afterwards admitted) upon ours, and that altogether, as to names of persons and numbers of streets, the office list was the more accurate of the two. As finally adjusted, there were found to be 39 retail customers acknowledged by Mr. C——, besides his own dairy, within the city bounds, and 8 in Possilpark. There were therefore at least 40 channels by which his milk reached the public of Glasgow at the date of this outbreak. These are indicated by red stars on this Post Office map, and are, as you will observe, scattered over the four sanitary administrative districts north of the Clyde; but more than half, including the agent's establishment, are in the northern district, with the dairies in which 66 per cent. of all the cases are associated. It is impossible to show the *cases* upon so small a map, but I have had *all* the deaths which have occurred in the city since 29th April (when the first death from this milk epidemic took place) put down at the place of residence of deceased, the red dots indicating deaths connected with the milk (37 in number), the small red stars those not known to be so (22 in number). I only wish you to observe how widely scattered the small red stars are, and how suggestively the red dots cluster around the large red stars. Indeed, the officer who laid down the dots complained that the stars representing dairies covered many of the places where he wished to put them, and so they are placed at the nearest point clear of the stars.

On allocating the cases among the 40 dairies it was found that 30, including Mr. C——'s own establishment, had fever among those who used their milk, and 10 had not, so far

as known. Of the 10, 1 is only an ice-cream shop; the quantity taken by all is very small, only from 1 to 3 pints\* of skim and sweet, with a little cream. Still there are other shops taking as small a supply which have associated cases. These occurrences belong to the category of hits and misses, which are familiar to all who study the ways of the contagia in their distribution, and are a proof of the theory rather than a difficulty in the way of its acceptance. Some of these dairies formed local epidemics, surrounding them singly or in groups, sufficiently defined to be spoken of as epidemic areas. To these we shall refer in detail.

1. *The Little Hamilton Street Area.*—The dairy which has the highest number of associated cases is that referred to as Dairy 1 C., which was the first epidemic area detected. Against it there are 71 cases. Of these 54 were found in the small area bounded by George Street on the S., Cathedral Street on the N., North Hanover Street on the W., and Montrose Street on the E.; while in Holmhead Street, and the portions of North Hanover and North Frederick Streets above Cathedral Street, there were 17, which accounts for the total number. Every house in this area has been visited repeatedly, and there is only one case of fever in a family which is *not* supplied by —. This family is just above —'s shop, though they get their milk from Hamilton's dairy, which, as I have said, has a large business in the district. In proof of this, let us take the result of a milk-census of the inhabitants of 89, 73, and 84 North John Street. In the closes and stairs indicated by those numbers there are 37 families, comprising 146 persons, aged 8 years and upwards, and 40 below that age. Of these, 26 families, comprising 101 adults and 26 children, are customers of Hamilton's dairy, and all were in good health; while 11 families, comprising 45 adults and 11 children, were customers of —'s, and of these, 6 families were infected with fever, of which there were 11 cases, and 1 had died. Dairy 1 C.

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\* Whenever I speak of pints it is the Scotch pint which is meant, or half a gallon imperial.

obtains daily 16 pints sweet, 32 pints skim, and 3 pints cream, from Mr. C—, which he retails with the product of 8 cows. He was good enough to furnish me with a list of the customers to whom he sends out milk, which he does in two "rakes," in the first distributing his own milk warm, in the second, at a later hour, Mr. C—'s. There are 48 families on the first list, and only 2 are infected, but they also get skim milk, which is all C—'s, and 14 on the second list, of whom also 2 are infected. The other infected families for the most part send for their milk to the shop, where, excepting a portion of the evening's milking, only C—'s milk is on sale. The infected element in this area is therefore undoubtedly the portion obtained from C— and distributed by Dairy 1 C.

2. *The Stirling Road Area.*—The shop which has the next highest number of associated cases is —'s or —'s (7 N. on the map), which has 57 cases. On reference to the map, it will be seen that this dairy, with four others, forms a group, all included in the small triangular area bounded by Castle Street on the E., by Parliamentary Road on the N., and by St. James' Road on the W. and S. The cases attached to these are 3 N., 2 cases; 4 N., 18; 5 N., 23; 6 N., 7—a total, with those attached to 7 N., of 107 cases, which, excepting a few straggling cases, all live within the limits given. One of these cases is at 2 Chatham Place, where there are 8 families (one house empty), and only one supplied by dairy 7 N., which is the family to which this case belongs. Although other dairies exist in or near this area, only four cases were found among their customers after an exhaustive house-to-house visitation. As dairy 5 N. and 6 N. sell only C—'s milk, in this area the infection attaches itself to this milk with still greater clearness.

3. *Springburn Road Area.*—This is a very important area in this respect, that dairy 1 N. is situated in a detached block of tenements opposite Sighthill Cemetery, to which its custom is entirely confined, but in which a large majority of the families are customers of other dairies retailing milk

from other sources. A milk-census was taken over this area, and with this result:—

Customers of Dairy 1 N.,	37	families, of whom 15 are infected, yielding 24 cases.
Do. another Dairy,	198	do. No Fever.
Do. 10 other Dairies,	53	do. of whom 1 infected, yielding 1 case.
Using no Milk,	4	do. No Fever.
Total,	292	
Houses empty or shut,	101	
Total Houses in area,	393	

So that in this area, out of 292 families, dairy 1 N. supplied milk to only 37; yet the fever fell upon 15 of those families, while of the remaining 255 all but one escaped. That one case sickened on 14th May, and therefore did not belong to the epidemic outburst, but is probably a secondary case. In fact, it occurred in a house which had been rendered vacant by the death of the previous tenant of enteric fever early in the epidemic. Only one meaning can be got out of these facts, and that is that the contagium of enteric fever was contained in the milk distributed from dairy 1 N., and that was obtained from two sources—an early morning supply of 4 pints sweet, 4 pints skim, and  $\frac{1}{2}$ -pint cream, delivered by C—; and a later supply of 12 pints sweet, 20 pints skim, and  $1\frac{1}{2}$  pints cream, brought direct from the farm by another agent.

I shall not prolong this part of my Report by going over the minor areas formed by the other dairies, but merely refer you to the map and relative list which is appended. Of course the reason for attributing the few cases associated with certain of the dairies is to be found in the demonstrated infectiousness of the milk therein retailed, based upon the large induction of the dairies in the areas specified above, and their coincidence in time. Special attention is directed to the fact that there are 17 cases among the customers of Mr.

C——'s own shop (22 N.), and 15 among those of his brother, 7 E. There are also 3 cases of direct infection from Mr. C——'s cart at 27 Port-Dundas Road, where there are 7 families (2 houses empty), of whom 2 are supplied with sweet milk every morning (apparently unknown to Mr. C——, who says his carts do not retail), and they alone are infected.

I conclude what I have to say in proof of the properties of this milk, by pointing to an extraordinary feature of this epidemic in relation to the shops or channels through which it passed to the public—*i.e.*, the number of cases in the families or households of the vendors. There were 40 shops, and of these no less than 12 were themselves infected. The following are the particulars:—The figures refer to the map. 2 E., a son ill; 1 C., two grandchildren; 1 N., three daughters; 6 N., a daughter; 11 N., two sons; 13 N., a son and daughter; 15 N., the proprietor and a lodger, and all the children were sickly also; 16 N., a daughter; 19 N., a son; 21 N., a son and two daughters; 22 N., a daughter, and all the other children sickly; lastly, in Mr. C——'s own establishment, a dairymaid. These cases gave me much trouble and caused a deal of anxiety. But for the strict and somewhat stern enforcement of measures which ensured absolute isolation of the patients from the retail trade, the infection might have been reduplicated with disastrous results. During the period under review I know of only one dairy or milkshop in the city, where febrile sickness existed which was not supplied with C——'s milk, and in that instance the disease was dubious in its nature; but all those enumerated were marked cases of enteric fever—mostly, indeed, unusually severe. In order to ascertain if any similar misfortunes attended the retail shops of other milk agents, I applied to Mr. Brand, of Devon Street, and Mr. Hamilton, of N. John Street, two of the most extensive dealers in the city, for lists similar to that furnished by Mr. C——, which they were obliging enough to give. On Mr. Brand's list there were 40 shops, on Mr. Hamilton's 51, situated in all parts of the town; and after a systematic visitation and inspection of each one, I found that good

health prevailed all round, at any rate so far as infections diseases are concerned; and random house-to-house visits in their neighbourhood disclosed no fever among their customers.

From the last letter in the correspondence we learn that Mr. C—— distributes his milk by means of three carts having distinct routes. The shops served by each cart are indicated in the list of dairies appended, from information supplied by Mr. C——. It is obvious that the infection was not associated with any one cart in particular, although cart No. 3, having on its route shops with but a trifling trade comparatively, has the smallest number of associated cases. Cart No. 2, which supplied Dairy 1 C., is the same from which the private parties in Port-Dundas Road got their sweet milk, and which conveyed the milk to the 8 dairies in Possilpark.

I shall only add under this head that Dr. Christie has been good enough to put into my hands a tabular statement of the details of the Possilpark area. I shall only say in general that they show complete harmony with my argument. I hope, therefore, I have said enough to convince you that, wherever Mr. C——'s milk acquired the specific infection of enteric fever, it certainly did possess it. It is not too much to say that the entire body of his trade during the period under review was tainted. It is associated with fever in his own household, in persons served direct from his own cart, it poisoned the families of the dealers through whose shops it passed to the public, and it poisoned the customers who dealt with those shops.

Let us now turn to the farm of ———, and see how the events which happened there agree with the assertion that it was from thence this infected element in Mr. C——'s business proceeded. Before entering upon the following narrative, it is right to say that the difficulty of fixing dates and getting at this consecutive history was enormous. The officers of the department, Mr. Inglis and Mr. Dobson, have been several times at the farm, and through the district. I spent a whole day driving about there myself, besides corres-

ponding with the parties concerned, and I have taken every possible precaution to put my statements beyond question. I acknowledge with pleasure the frank and friendly way in which I was met, as well as written to, by the three medical men concerned in this narrative.

In this rough diagram, or "Fever Calendar," the whole story is compendiously displayed, so that, as nearly as possible, you may see as I proceed the course of events, and their relation to the facts already before you.

In the first place, the epidemic comes quite within the period when milk was being sent from this farm into Glasgow. The facts are singularly exact. The first milk for the season was despatched on 26th March, the first case sickened on 9th April. Thereafter this milk was sent in at intervals of two to four days, several of the 12 cows being yeld, so that it took that time to accumulate a sufficient quantity. Each successive milking was creamed and stored, and the whole was sent off as skim and cream. As the dates and quantities are of great importance, I give them as furnished by the farmer.\* In the diagram the quantities are inserted opposite the date of despatch.

March 26th,	...	3 Butts,	...	11 Gallons.
" 29th,	...	2 "	...	5 $\frac{1}{2}$ "
April 1st,	...	2 "	...	7 $\frac{1}{2}$ "
" 5th,	...	2 "	...	7 $\frac{1}{2}$ "
" 8th,	...	3 "	...	10 $\frac{1}{2}$ "
" 10th,	...	2 "	...	7 $\frac{1}{2}$ "
" 12th,	...	2 "	...	7 "
" 14th,	...	3 "	...	10 $\frac{1}{2}$ "
" 17th,	...	2 "	...	7 $\frac{1}{2}$ "
" 19th,	...	3 "	...	12 "
" 21st,	...	2 "	...	7 "
" 23rd,	...	2 "	...	7 "
" 26th,	...	2 "	...	12 "
" 28th,	...	2 "	...	7 $\frac{1}{2}$ "
<hr/>				
Total, 120 Gallons.				

\*As will be seen from the correspondence, this statement is admitted by Mr. C—— to be substantially correct.

The next question is, Was the specific contagium of enteric fever within reach of this milk? Did it exist at \_\_\_\_\_? This narrative gives the answer. On 26th January, 1880, a servant girl, Jane N\_\_\_\_\_, who had for some weeks been awaiting her confinement in her mother's house, in the village of Buckleyvie, was delivered. She made a good recovery, and on Monday 23rd February (28 days after) was able to enter service at the farm of \_\_\_\_\_. She continued well until 12th March (46 days after confinement), when she became feverish and ill. Her illness proved long and severe, as was evident from her condition, as already described, when I saw her on 29th April. She was visited by two medical men, one the parochial officer, who saw her at the first, and took over the case at the last, prior to her removal to the poorhouse; but she was attended, during her illness, by —, —, —, the \_\_\_\_\_ family doctor. To make a long story short, he writes,—“When I first saw the girl at \_\_\_\_\_, she was suffering from pelvic cellulitis, going on to abscess. \* \* \* Thereafter I believe she had enteric fever.” The girl's mother, who nursed her throughout, states that she had severe diarrhoea, and was at one time in an absolutely helpless condition, as indeed was sufficiently evident from the extensive bedsores.

The next event was the sickening, on 25th March, of Thomas and John, children of the farmer, aged 3 and 5 years respectively. The mother says, “John never lay an hour,” but the medical attendant writes me that both had “infantile typhoid.” Thomas is the child I saw in a very sickly condition at my first visit. He was extremely ill, and in fact was not expected to survive.

So much for the residents at the farm. At the outset of Jane's illness, which seems to have been very sharp, she sent for her mother to Buckleyvie, but not being able to leave at once, the mother sent another daughter, Margaret, aged 15, who reached the farm on the morning of the 17th March, and remained until the 18th, when she was replaced by her mother. This girl got her meals at the farm, and had milk

to her potatoes on the 17th March. She sickened at Bucklyvie on the 1st April, and passed through what Dr. Stuart writes was a typical attack of enteric fever. I saw the girl on 14th May, when she was still much debilitated.

The next event takes us back to —— ——, a little house a few minutes' walk from the farm, on the opposite side of the road and of the ridge along the top of which the road runs. Mr. ——, who lives there, keeps a cow, but it began to get yeld in the beginning of April. It calved on 23rd May. I have in every conceivable way endeavoured to get at a precise date for the time when Mrs. —— first began to supplement her cow's yield, and then regularly to take her pint of sweet milk from —— farm, when her cow became dry. It was paid for as got, and there is nothing but memory to refer to. The farmer says she took no milk until the *end* of April, but that is certainly a mistake. One statement of Mrs. —— is that she got milk first three weeks after the Killearn school examination. Now that was on 2nd March, and this gives 23rd March as the date. Another statement is that it was before her boy John's arm was broken. The doctor tells me he saw this arm on the 10th April. But she admits that whenever she began her *regular* purchases, she previously got "drops of sweet milk" on three or four occasions; and here again I say people do not live, especially in the country, in anticipation of a scientific inquiry into those trifles which have become exalted into tragical importance. You have a cow becoming yeld, and five young children requiring milk, and a farm where milk is to be got at hand. The rest follows as a matter of course. At all events Mrs. —— is quite sure that *before* her children sickened she had been getting this milk. There are two facts that point to the date of sickening, which is equally difficult to get at directly. The four children who fell ill did so almost together. Three are at school, and the school attendance record shows that one disappeared on 2nd April, and two on 9th; while the doctor, who saw the broken arm on the 10th, says they were then all ill,

and that in his opinion the disease was *enteric fever*, but of a mild type. At the date of my visit—viz., 14th May—the eldest daughter had risen for the first time and was much debilitated.

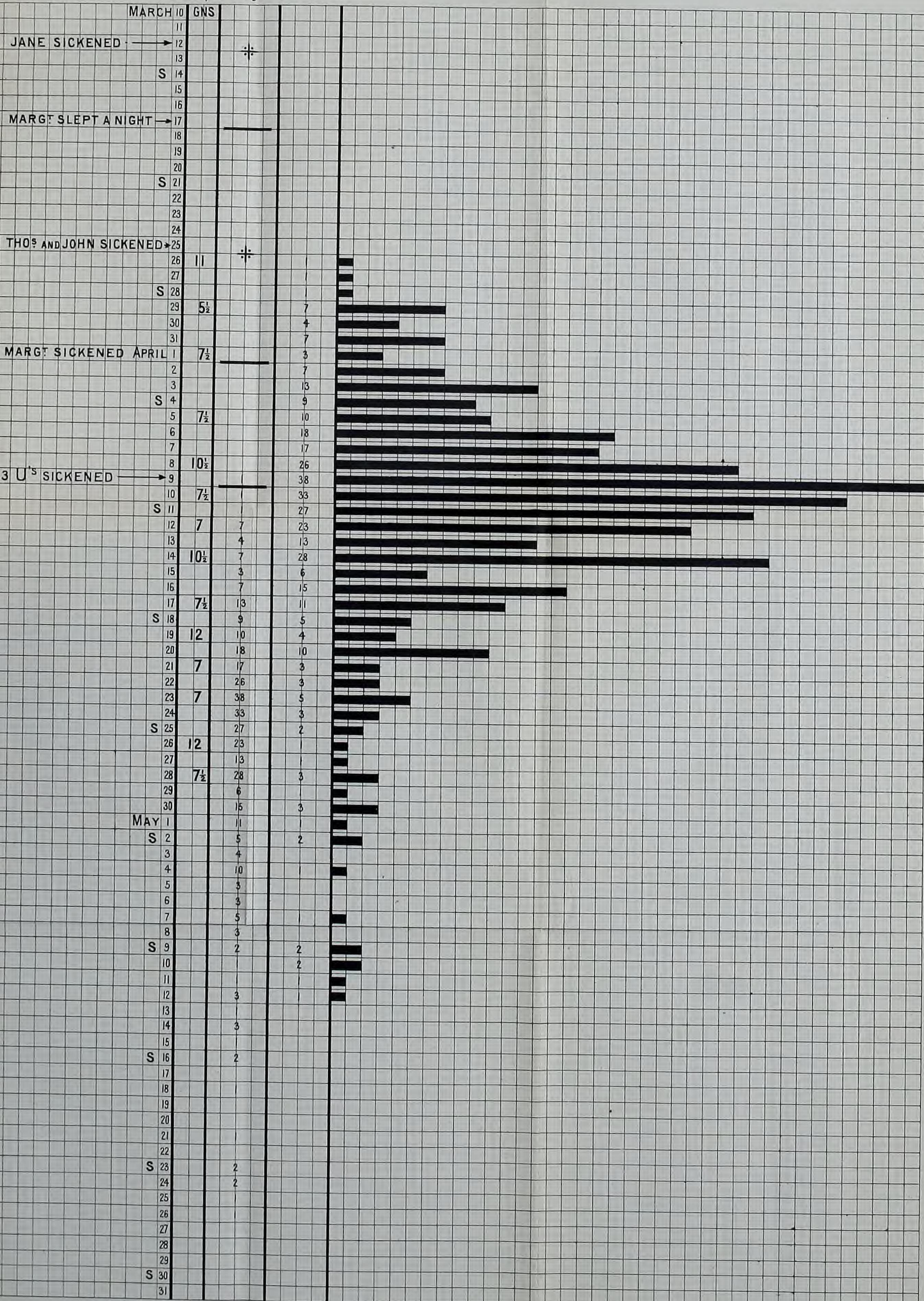
Turn now to our rude chart, and let us read the whole history. The dates of delivery of the milk, of the sickening of those persons at the farm and in its neighbourhood, and the daily numbers sickening in the Glasgow fever areas, are all indicated, so as to make a calender. You observe the dairymaid sickened on 12th March, her sister slept a night with her, and partook of milk on 17th March, and sickened exactly 14 days thereafter; the two children sickened on 25th March; on 26th March the first lot of 11 gallons of milk was sent off to Glasgow; exactly 14 days thereafter the first case in the area of Mr. C——'s milk supply sickened, and at ———, Mrs. ———'s four children fell ill.

I used the analogy of the sowing of seed as illustrative of this epidemic. I said that the interval between the sowing and the appearance of the green blade corresponded to the period of incubation between the reception of the contagium into the body and its interference with health. Now, suppose a handful of seed thrown broadcast over the soil by one act, if we chanced to note the date of appearance of each blade, and had by previous observation ascertained the average period after sowing at which such appearance occurs, we could, by going back that distance from the day on which most of the blades appeared, fix very nearly the actual date of sowing. It is exactly the same with diseases whose seeds can be sown. We know how many of these 373 cases sickened each day. Fourteen days is the average interval of incubation of the seeds of enteric fever; let us dislocate, so to speak, the events in this calendar from their dates, and shift them back 14 days. This is done, and the numbers sickening are indicated by the proportional height of the black columns. Margaret, we know, without any guessing about it, partook of milk on 17th March, and fell ill 14 days after. Whatever else was the medium about the farm which might have con-

# FEVER CALENDAR

1880

MILK DESPATCHED  
CASES SICKENED

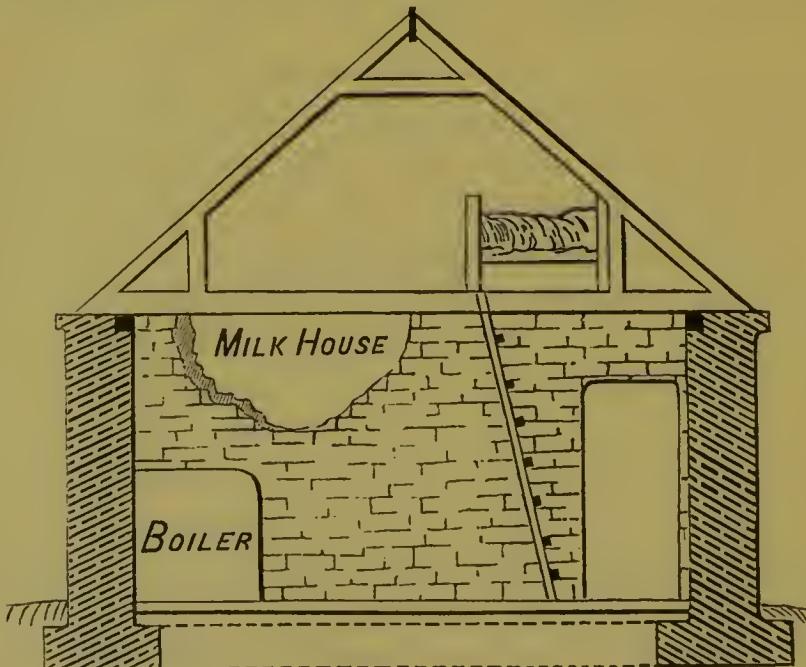




veyed the disease to this girl, the milk alone could convey it to Mrs. ——'s children, as there was nothing common to the two houses but the milk. They stand on opposite sides of the watershed. Yet, whoever went personally to this farm-steading, or lived there, came within the sphere of all the local influences, and all that can absolutely be said is, that something there, immediately on Jane's illness, acquired infecting power. As to the illnesses represented by the black columns, there can be no question. The milk was sent to those who took ill. It was the only thing common to those persons and to the farm. You will observe that the maximum of sickening comes opposite the 10th of April, when the children and the girl were all ill together. You will also observe that there are evidences of more than one act of sowing evidently related to the successive deliveries of milk. It seems to me probable that each lot was infected from the first on to that sent off on the 14th, and perhaps also the 17th, April.

There can be no doubt, then, that the specific contagium was within reach of the milk, and that it got into the milk. It now only remains to inquire what evidence the structure and general arrangements at —— afford of facilities for such an occurrence. The farm has a bad health history. The farmer stated that 20 years ago he had typhoid fever, but it was brought, he says, by a sister's family coming there from Glasgow, after having that disease. This satisfies Mr. ——, but it shows that there was something radically wrong at his farm nevertheless. Nine years ago diphtheria attacked the family. There were five cases and two deaths. Again it is alleged that the disease was brought from Glasgow by convalescent relations. In the beginning of 1879 a maid took enteric fever, was treated at the farm, went subsequently home to Bucklyvie, and thereafter her mother and sister fell ill. The sister died of the fever on 4th February, 1879. Again it is alleged that the disease was brought to the farm, as another sister was ill at home before the servant took it. The medical man who attended and certified this fatal case, tells me that, previous to this occurrence in 1879, he had seen

a man-servant who had taken the same fever at this farm in that year. We cannot be surprised at such events when we look at this isometrical plan of the steading drawn by Mr. Dobson. I merely direct attention to the most important facts for our present purposes. The milk-house, washing-house, kitchen, and living apartments, are all *en suite*. The washing-house is only a part of the milk-house, or *vice versa*, as we choose to take it, separated by a slim wooden partition, and the boiler for washing and for scalding tins is in a recess in open connection with both places. The room where the children lay is the bedroom next the kitchen. The dairy-maid passed through her illness above the milk-house and washing-house, in a garret, the steep ladder leading to which is shown in the plan. The bed stood towards the front over



[THE WOODCUT SHOWS A CROSS-SECTION THROUGH THE RECESS IN WHICH THE BOILER STOOD, AND WILL GIVE A CLEARER IDEA OF THE ARRANGEMENTS.]

the washing-house, and the stains upon the floor, visible to my eyes on 14th May, bore evidence to the severity of her illness and the attendant risks. The excreta were thrown over the dung-heap. The privy shown at the end of the byre is an erection which is in such a state of dilapidation that no person having a remnant of decency could use it.

The well is sunk in the ground in the position shown, 12 feet 5 inches in sand and gravel. It is well lined with brick, and was found to be clean when opened. The bottom of the well will be seen from this sectional diagram to be 3 feet below a pool of stagnant water, and considerably more below the dung-heap which extends over the slope. When examined by Mr. Dobson, the water-level was slightly higher in the well than at the pool, but still the circumstances are not satisfactory. Dr. Wallace's report on the analysis of the water is appended. He states—"I am of opinion that it is contaminated to a small extent with animal products. As, however, these are almost completely oxidized, and so rendered harmless, the probability of disease arising from the use of the water is somewhat limited." This simply means that there is a soakage from this dung-heap and pool into the well, but at the time this sample was taken, it was so small in quantity that the intervening sand had been able to oxidize it.

The small blue patch shows the position of a dip-well at the foot of the green slope, and in open communication with all the sodden marshy area leading to the manure-heap. It was there that the dairymaid's mother washed overnight the soiled changes from her daughter's sickbed. The pump is out of fang, and when the farmer wished to pump up a little water for inspection, he set it working with some dirty-looking water. Taking into account the requirements of human beings and cattle, for washing clothes, scalding tins, and other domestic purposes, along with the shallowness of the pump well, and the difficulty of getting at the water, there seems an evident risk that at times the water of this dip-well might be brought to the house for certain of these purposes, but I am assured that it was used only for washing, being a softer water.

Perhaps you may expect me to conclude by entering into the question how the contagium got into the milk, but I shall leave you to put your own construction upon the circumstances into the midst of which I have traced this portion of Mr. C——'s supply. In such cases you must first

ascertain all the conditions under which the household life or business is usually carried on, then introduce the disease into the sphere of these activities, and imagine the result. I therefore leave you to imagine for yourself—from all you know of serious illness from enteric fever, from the equally dangerous circumstance of a child who “never lay an hour,” although it had the same fever—under what conditions the milk must have been, first milked, then set out to cream, and stored for days in that milk-house in the months of March and April. In setting for cream, the largest possible surface is exposed. The result was, as the sequel showed, to produce a virulent poison—a sort of essence of fever. I can only account for the strength of the infecting power by supposing that during storage the contagium multiplied in this animal fluid, as it does in the blood, and as other contagia can be made to do for experimental purposes in artificial fluids, not unlike milk in composition in some respects.

There is one matter, however, which merits some more minute consideration. The articles delivered to Mr. C—from this farm were skim milk and cream, so that primarily only those articles, as sold to the town vendors and consumers, ought to have conveyed the infection. If reference is made to my correspondence with his agents it will be observed that an attempt is made to prove (1) that no —— milk reached Dairy 1 C.; and (2) that it was very improbable that any of it could have reached anybody in its primary condition, as it was all or nearly all churned, “as he did not look upon it as good keeping milk, and preferred letting his customers have better”—a statement which, it may be remarked by the way, implies some obvious physical peculiarity about this milk which is suggestive of unwholesomeness, or at least suspicious inferiority.

In neither of these efforts has Mr. C. been very successful. As already pointed out, under date 28th April, in transmitting the list of farmers, while indicating those farmers whose milk probably reached Dairy 1 C., he adds, “It is, however, quite possible that —— may have got the milk of the

other farmers," one of whom was the owner of ——. That stands as his opinion, when neither he nor I had any idea which of the number was to be suspected. Besides, one of the five farms against which the agents marked a cross to show that ——'s forenoon delivery "most likely" came from them, was situated near Balfron, so that his milk came by the same train on the same line of rail, and was delivered at the same station (viz., Queen Street) as that from ——. Yet, under date 30th April, the agents are instructed to say that "Mr. C—— does not think that any of this milk would be delivered to ——, *as it was sent to Glasgow by the N. B. Ry., delivered at Queen Street.*" We are told that "the carts lift from Buchanan Street first, and *on their way to Queen Street*\* were in the habit of calling at ——'s, so that he would only get Buchanan Street milk." After further inquiry, he subsequently (1st May) "states positively that none of ——'s milk, during March and April, was delivered to ——;" but we are also told (correspondence under date 7th June) that "*—'s milk was checked at Mr. C——'s premises in St. George's Road*"—i.e., before being distributed it was driven from the station to these premises and measured. What, then, can be the meaning of suggesting that the possibility of ——'s milk reaching Dairy 1 C. had anything to do with the route which the carts followed in lifting the milk at the two stations?

Next, as to the churning, which, it may be remarked, is in all probability a disinfecting process, owing to the acid products. Also under date 30th April, the agents are instructed that "since ——'s milk came, in March, Mr. C—— churned almost daily an average of 100 gallons, or perhaps rather over that amount;" and for the remarkable reason referred to above, "Mr. C——'s impression is that ——'s milk was *almost always churned.*" This is a very frail basis for a fact which was to determine the treatment of an article, even the exceptional use of which in its original condition

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\* The *italics* are mine.

was sufficient to poison and to produce all the results which I attribute to it. In next letter (1st May) the "impression" has not become more robust. The final statement is this—"Though Mr. C—— is not able to say that on every occasion —'s milk was churned, he is almost certain that it was so. *It may, however, on an odd day or so, have been disposed of among his customers along with his other milk.*" This is quite sufficient to account for all the facts. Like Mercutio's wound, "'Tis enough, 'twill serve."

Skim milk and cream being the infected articles, let us look somewhat more closely into the sorts of milk with which the persons infected were supplied. This information was carefully collected from the lips of the heads of families. In the northern district there were 254 cases, regarding 9 of which, for various reasons, no information could be got, but of 245 the supply was stated to be as follows:—

Sweet, Skim, and Cream,	...	...	...	85
Sweet and Cream,	...	...	...	54
Sweet and Skim,	...	...	...	60
Cream and Skim,	...	...	...	6
Sweet only,	...	...	...	37
Skim only,	...	...	...	2
Cream only,	...	...	...	1
				245

so that 37 persons were infected who alleged that they only used sweet milk.

This is a survey of the business of all the shops, but there are 9 of those whose proprietors stated that they sold Mr. C——'s milk only (viz., 6, 10, 11, 12, 13, 15, 18, 20, all North). All but one (who got sweet and cream) got the three articles, and all had associated cases of fever—in all, 60 cases. Regarding one no particulars could be obtained, but the statements of the remaining 59 infected customers are—

Sweet, Skim, and Cream,	...	...	...	19
Sweet and Cream,	...	...	...	11
Sweet and Skim,	...	...	...	18
Cream and Skim,	...	...	...	4
Sweet only,	...	...	...	6
Cream only,	...	...	...	1
				59

so that 6 persons were infected who alleged that they used only sweet milk bought from shops which retailed Mr. C——'s milk only.

As already stated, 17 cases were associated with Mr. C——'s own shop. The particulars as to these are as follows:—

Sweet, Skim, and Cream,	...	...	...	7
Sweet and Cream,	...	...	...	4
Sweet and Skim,	...	...	...	2
Cream and Skim,	...	...	...	1
Sweet only,	...	...	...	2
Skim only,	...	...	...	1
				17

so that 2 persons were infected who alleged that they used only sweet milk bought at Mr. C——'s own shop. To the same class belong the 3 remarkable cases in Port-Dundas Road, which occurred in two families who got a daily supply of sweet milk, and sweet milk only, direct from one of Mr. C——'s carts. One dairy (viz., 16 N.) is said only to get 11 pints of sweet milk from Mr. C——, and with it there are associated 8 cases of fever, 3 of whom purchased sweet and cream, 3 sweet and skim, and 2 sweet only.

The explanation of these facts involves delicate considerations. The simplest is that afforded by the practice of using the same measuring tins for checking the invoices of sweet and skim milk, and the same measures for serving customers with those different milks.

There are one or two additional points in these epidemics which might be elaborated, but for the present I shall refrain. I had intended to say something about the necessity of measures being taken for the prevention of such occurrences; but if, after reading this narrative, we place clearly before our minds two propositions:—(1) That none of this sickness and death would have occurred in Glasgow but for a combination of circumstances in the country, of which those sicknesses and deaths are the natural outcome, but which were nevertheless clearly preventible; (2) That similar combinations of circumstances may again take place at any moment at scores of farms which are equally ripe for the event, surely nothing

more need be said. As time passes, the seope and power of milk as a medium for the distribution of enterie fever in towns is gradually being demonstrated. This seems to be the only path by whieh the public mind can reach the point of action. It remains to be seen whether this, the last and worst of the many milk epidemics from whieh Glasgow has suffered, will suffice to bring the mind of the Glasgow public to that point. From the date of the first detection of milk as a medium, it was only neecessary to know the sources of the milk supply of towns, the mode in which it is eolleeted and distributed, to be able to predict all that has now been learned by dire experience. With that experience, the prediction of equal, if not greater, developments of the latent powers of this medium under possible circumstances, if some measures of self-proteetion are not adopted, is a very safe aet of propheey. I shall only add that I go heartily with the principle of Sheriff Spens' draft "Aet for the Sanitary Regulation of Plaees of Milk-supply to Towns."

JAS. B. RUSSELL.

## APPENDIX.

1. CORRESPONDENCE WITH MR. C—  
AND HIS AGENTS.

## 1.

Sanitary Chambers, 1 Montrose Street,  
Glasgow, 27th April, 1880.

MR. T— C—, Dairyman,

SIR,

I am at present endeavouring to ascertain the cause of a sharp outbreak of enteric fever in Little Hamilton Street and its vicinity. In the course of my inquiry I found that the families affected, so far as known, are customers of Mr. —, dairyman, ——————. He derives his milk from two sources—from his own cows, and through your agency.

Yesterday afternoon, as soon as I ascertained these facts, I instructed Wm. Armstrong, Inspector of Dairies, &c., under "The Contagious Diseases (Animals) Act (Dairies, Cowsheds, and Milkshops' Order, 1879)," to wait upon you, and ask from you the names and addresses of the farmers whose milk passes through you to Mr. —. He informs me that you refused to give them, except upon one condition—that I should publish no names, even in the event of my investigation resulting in the discovery of the source of contamination. This is a condition to which I cannot agree, more especially in view of the fact that such a discovery would almost necessarily imply an offence under the Act above referred to.

I beg therefore now, as Medical Officer of Health for Glasgow, to state that it is essential for the performance of my duties that you should immediately inform me of the names and addresses of the persons whose milk you send on to Mr. —, dairyman, ——————, or have sent at any time since the 1st of March last. I have accordingly to request you to furnish me with them in writing before 10 A.M. to-morrow, 28th April; and I

have to warn you that, failing the reception of that information before that hour, I shall hold myself at liberty to send a copy of this letter to the newspapers, or otherwise to bring your attitude in reference to the health and life of the public to the bar of public opinion.

I am, SIR,

Your obedt. Servant,

JAS. B. RUSSELL, M.D.,

*Med. Officer of Health.*

2.

—————, Glasgow,  
27th April, 1880.

DR. JAS. B. RUSSELL,  
Medical Officer of Health,  
Sanitary Department, 1 Montrose St.

DEAR SIR,

Mr. T—— C——, dairyman, —————, has handed us yours of this date, and is somewhat surprised at its tone. You may recollect, some time since, when you were desirous of getting a note of his farmers, he called upon you and explained the injury which is likely to be caused to a business similar to his by any undue or hasty publicity of names in a matter such as you refer to, when on that occasion you at once gave him an undertaking to suppress his name in connection with the affair; and when your officer called upon him this morning (on which occasion Mr. C—— requested a renewal of your undertaking) he (Mr. C.) expected it would be given as readily as before, and we think our client's surprise at the tone of your letter, without making any further explanation to him, is not altogether without foundation.

Our client, however, has no desire to do anything which the Authorities might fancy was preventing them fulfilling their duty to the public, but Mr. C——'s sole desire was and is to be assured that any action the Authorities might adopt was carried on with a due regard to the interests of all parties who might be connected with any such investigation—more especially as he has reason to believe that the action of the Authorities in similar cases has

inflicted very serious loss to persons situated as he is. We doubt not that you will be quite willing to protect to the utmost our client's interests, and the only request we would make would be, that whoever may be employed, on behalf of the Authorities, to conduct the investigation, would report to us, as agents for Mr. C—, from time to time the result of his inquiries, and should our client request that any further investigation in any direction be instituted, that such be done by your staff. We think that you will at once see that, in making this request, we are asking nothing unreasonable, and on learning that you are agreeable to it, we are quite prepared at once to hand you the list of farmers.

Yours faithfully,

(Signed) \_\_\_\_\_.

3.

Sanitary Chambers, 1 Montrose Street,  
Glasgow, 28th April, 1880.

\_\_\_\_\_, Glasgow.

GENTLEMEN,

I have yours, as agents for Mr. T— C—, dairyman, \_\_\_\_\_. I remember perfectly the former occasion, when Mr. C. called upon me in somewhat similar circumstances, and received from me verbally that which I now give in writing—the assurance, in general terms, that his interests will be respected by me so far as my duty to the public permits.

I need only add that, while I claim the information asked as necessary to be had in the interests of the public, it is even more for Mr. C.'s interests that it should be given. The suspicion which now lies at his door is not created by me. It is there in the facts which are already within the knowledge of several medical men and a section of the public. My inquiry will, in all probability, remove the blame from him. Already, however, Mr. C. has taken upon himself the responsibility of wilfully causing a delay of nearly two days in an investigation in which, if the circumstances at all resemble those of the Hillhead outbreak, every hour lost means injury to the public health.

I cannot agree to any direct report to you, as Mr. C.'s agents. Indeed, communication through an agent is not even consistent with that frank interchange of ideas and information which must obtain between me, my officers, and the dairyman, &c. Of course, your suggestion as to my taking up any line of inquiry which may seem to you to advantage your client is so far just, and I assent; but as I am not a special pleader for a conviction, but a scientific inquirer to the best of my ability, it is not likely that any essential part of my case will be neglected.

I hope you will put the bearer, Mr. Armstrong, in possession of the required information without delay.

I am, GENTLEMEN,

Your most obedt. Servant,

JAS. B. RUSSELL, M.D.,

*Med. Officer of Health.*

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4.

—————, Glasgow,

28th April, 1880.

DR. JAMES B. RUSSELL,  
1 Montrose Street.

DEAR SIR,

We are in receipt of yours, without date, delivered by Mr. Armstrong.

We cannot assent to the statement made by you, that Mr. C— has been the means of wilfully causing a delay of nearly two days. It was only yesterday morning, about 9 o'clock, that he first learned your request, and had the assurance you have now given been granted, the information desired would have been handed you. Mr. C— stated to your officer that he would be willing to meet him in our office here yesterday at 4 o'clock, which appointment he accordingly kept. No one appearing from you, we, at a quarter past 4 o'clock, wrote and sent you our letter of yesterday, and the writer purposely remained in town to receive your reply and give the information. Instead of getting any reply, a verbal message was sent by our clerk to the effect that you had no time to write, but in the morning would send an answer which would be satisfactory to us, and that you hoped we

would have the information ready at an early hour. We have accordingly remained here the whole forenoon, and your letter is only delivered shortly after 12 o'clock. Doubtless any delay on your part will have arisen through your time being occupied with other duties, but we do not see how blame is attachable to Mr. C—.

We annex a list of the farmers who, since 1st March last, have sent milk to Mr. C—.

The milk supplied to — in the morning would be received from the first three in the list, and the forenoon delivery from those, most likely, against whom we have marked a cross. It is, however, quite possible that — may have got the milk of the other farmers.

Yours faithfully,  
(Signed) ——————

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- 1 George Faulds, Wellflat, by Kirkintilloch.
- 2 Robt. Donald, Blochairn, by Milngavie.
- 3 Jas. Galbraith, Carbeth Guthrie, by Strathblane.  
Geo. Buchanan, near Gartness Station, by Drymen.  
Matthew Scott, Cairnlee Station, by Drymen.
- ✗ Robt. Paterson, Woodend, by Balfour.  
Thos. Duncan, Dullatur, by Kilsyth.  
David Shearer, Newbigging, by Carnwath.  
Geo. Forrest, Bleandewan, by Biggar.

NOTE.—For a short time in winter and, Mr. C— thinks, a portion of March, Mr. Forrest, besides his own milk, sent the milk of another farmer, whose name and address Mr. C. cannot at present remember.

Walter Frood, Whiterigg, Raughan Mill, by Biggar.  
John Tudhope, Broughton Place, Biggar.  
Jas. Dickson, Mayfield, by Lesmahagow.  
Thomas Weir, Townhead, Ponfeich, by Douglas.  
Jas. Tennant, Dyke, do., do.  
Jas. Affleck, Barnhills, do., do.  
Archd. Brownlie, Easterton, do., do.  
Thos. Steel, Newtonhead, do., do.  
Robt. M'Kinlay, Hillhouse, Sandlands, by Lanark.

- × John Steel, Skellyhill, by Lesmahagow.
- × John Steel, Waterhead, by Lesmahagow.
- × Andrew Semple, Woodhead, by Lesmahagow.
- × Jas. Semple, Dykehead, by Lesmahagow.

NOTE.—Besides Dykehead, J. S. has the adjoining farm.

- A. M'Caw, Townhead of Glengillan, Holywood, by Dumfries.
- Thos. Hislop, Kilbrook, Wamphray, by Beattock.
- David Gibson, Barns, Johnstone, by Beattock.
- Jas. Brown, Auchrobert, by Lesmahagow.
- Thos. Pate, Cuchlehead, by Lesmahagow.
- Michael Wilson, Waterhead, by Lesmahagow.
- Mr. Cowan, Dunragit.

NOTE.—This was a farmer who had sold his milk to Mr. David Imrie, Strathbungo, and during March Mr. Imrie allowed Mr. C—— to get Cowan's milk, Mr. C—— taking delivery as the milk arrived at the station.

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5.

N O T E.

I answered this letter immediately on receipt, shortly. Unfortunately no copy was kept, but it was to this effect, that Messrs. \_\_\_\_\_ recital of the facts did not alter my opinion as to the effects of Mr. C.'s conduct, especially in view of the meagre result. The conditions accepted did not seem to me to be either worth his while to ask or mine to give.

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6.

Sanitary Office, 1 Montrose Street,  
Glasgow, 30th April, 1880.

\_\_\_\_\_,  
\_\_\_\_\_, Glasgow.

GENTLEMEN,

Last night I advised your client, Mr. C——, by telegram, that fever existed at the farm of \_\_\_\_\_, \_\_\_\_\_, from which I had just returned, and that I had stopped his milk.

In order to complete the inquiry, it is necessary that I should have certain important items of information which your client alone can supply, and which I shall be glad to receive at your earliest convenience, viz.:—

- 1.—From 1st March, the quantity and date of each delivery of \_\_\_\_\_ milk.
- 2.—The destination of this quantity on each occasion—*i.e.*, the name and address of Mr. C——'s customers, who received the whole or a part of this milk at each date.
- 3.—I wish also to know if Mr. C——'s carts sell any milk by retail from the cart, and if so, whether any of this milk was so retailed, where and when?

I have no doubt you will see the important bearing of these facts upon the question in hand, and will endeavour to obtain from your client as correct data as possible.

I am,

Your obedt. Servant,

(Signed) JAS. B. RUSSELL.

7.

Glasgow, 30th April, 1880.

DR. JAS. B. RUSSELL,

1 Montrose Street.

DEAR SIR,

Immediately on receipt of yours of this date, we sent a copy of it to Mr. C——, who has just called upon us.

In reference to your first inquiry, the following are the dates and quantities of milk received from \_\_\_\_\_ since 1st March, viz.:—

					11 Gallons.
March	26,	...	...	...	
"	29,	...	...	...	51 $\frac{1}{2}$ "
April	5,	...	...	...	7 $\frac{1}{2}$ "
"	10,	...	...	...	7 $\frac{1}{2}$ "
"	12,	...	...	...	7 "
"	14,	...	...	...	10 $\frac{1}{2}$ "
"	17,	...	...	...	7 "
"	19,	...	...	...	12 "
"	21,	...	...	...	6 "
"	23,	...	...	...	7 "
"	26,	...	...	...	12 "
"	28,	...	...	...	7 $\frac{1}{2}$ "

Mr. C—— does not think that any of this milk would be delivered to —, as it was sent to Glasgow by the North British Railway, delivered at Queen Street. Mr. C——'s railway milk comes to Buehanan Street and Queen Street Stations, and it is lifted by two of his carts. The earts lift from Buehanan Street first, and on their way to Queen Street were in the habit of calling at F——, so that he would only get Buchanan Street milk. Whether this was so in every ease when ———'s came to Glasgow, Mr. C—— will [not] be positive just now, as he has not had an opportunity of examining the men who had charge of lifting the milk. He will, however, see partieularly as to this, and we hope to let you know early to-morrow.

Mr. C——'s impression is, that ———'s milk was almost always churned, as he did not look upon it as good keeping milk, and preferred letting his customers have better. Since ———'s milk came in March, Mr. C—— churned almost daily, on the average 100 gallons, or perhaps rather over that amount— ———'s milk being of course mixed with the whole quantity. The butter and butter-milk were disposed of through Mr. C——'s own shop, and some of the other shops he supplied with milk. He does not think that — got either butter or butter-milk. Mr. C—— will try and let us have to-morrow a list of the shops so supplied. Mr. C—— does not retail from his carts.

Yours faithfully,

(Signed) \_\_\_\_\_

8.

—————, Glasgow, 1st May, 1880.

DR. JAS. B. RUSSELL,  
1 Montrose Street.

DEAR SIR,

Referring to ours of yesterday, we have just had a call from Mr. C——.

From the inquiries he made last night, he is now in a position to state positively that none of ———'s milk, during March and April, was delivered to —. Though Mr. C—— is not able to say that on every occasion ———'s milk was churned, he is

almost certain that it was so. It may, however, on an odd day or so, have been disposed of among his customers along with his other milk. We send you annexed a list of the customers who have been supplied with butter and butter-milk churned by Mr. C— during March and April.

We will be glad to know the result of your inquiries at the farms, and if any illness was found at any but ——'s. We would like also to be informed of the particulars regarding the outbreak at ——'s farm.

We understand there is a good deal of enteric fever throughout the City, and as you will doubtless be in possession of all the details, we would like to be furnished with a note of the localities where such exists, the number of people affected, and the dates, as near as possible, when they took ill.

Your time just now will likely be pretty fully occupied, but we will be glad to hear from you with reference to the above particulars when you can conveniently do so.

Yours faithfully,

(Signed) \_\_\_\_\_

[In a subsequent letter they rely on these lists being kept private, and accordingly the list appended is suppressed.]

9.

Sanitary Office, 1 Montrose Street,  
Glasgow, 8th May, 1880.

M———, \_\_\_\_\_,

GENTLEMEN,

There are some points arising out of your communications of 30th April and 1st May which require a little explanation.

1.—As to the quantity of milk received from B———.

On comparing Mr. C———'s statement of receipts with Mr. ——'s record of despatches, I find that all the dates and quantities given by the former agree with those of the latter, excepting on 17th April, when Mr. —— takes credit for  $7\frac{1}{2}$  gallons, Mr. C———

having 7. This is a trifling affair, but besides, Mr. B. has on record  $7\frac{1}{2}$  gallons sent on 1st April and  $10\frac{1}{2}$  on 8th April, which Mr. C. omits to return.

2.—I cannot reconcile Mr. C.'s statement, that he does not retail from his carts, with the statement of Mr. \_\_\_\_\_ (3 up) and Mr. \_\_\_\_\_ (1 up), 27 Port-Dundas Road, that they have long so obtained milk.

Your information as to the parties supplied with butter, buttermilk, &c., is useful, but it will be necessary for Mr. C. to furnish me with a complete list of all the shops, &c., to which he supplied milk of any kind during the period in question. I shall be glad to have this information at your early convenience.

I note also in yours of 1st May certain requests for information, in response to which I must beg your client to exercise a little patience. When my inquiry is completed and submitted to the Local Authority, it will be time enough to make suggestions, if he finds that something has been omitted.

I am,

Yours truly,

(Signed) JAS. B. RUSSELL.

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10.

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Glasgow, 8th May, 1880.

DR. JAS. B. RUSSELL,  
1 Montrose Street.

DEAR SIR,

We are in receipt of yours of this date, and hope to be able to write you fully in answer with the desired particulars on Monday, after we have heard from Mr. C.—

Although you may not have time to give us fully the information requested in ours of 1st current, we will be glad if you can give us even a portion of what is asked. We may mention that a Committee of the Dairymen's Association are busy inquiring into the present question, which is not only important to the public, but also to the dairy trade, and they are anxious to be thoroughly satisfied on the question. Any information you can give might

help them in their inquiries, and we trust, for the sake of all concerned, that no report will be allowed to be published until the whole matter be thoroughly investigated.

Yours faithfully,  
(Signed) \_\_\_\_\_

11.

\_\_\_\_\_,  
Glasgow, 11th May, 1880.

DR. JAS. B. RUSSELL,  
1 Montrose Street.

DEAR SIR,

Referring to ours of 8th current, we have now procured and send you annexed a list of the shops supplied by Mr. C—.

In reference to the quantities of milk got from \_\_\_\_\_, the difference on 17th April arises from the fact that Mr. C— claims that the milk was short that morning, and that the quantity noted by him as received is accurate. Mr. C— has no note of receiving any milk on 1st April, but it is possible that \_\_\_\_\_ line for that day, from which Mr. C— makes up his books, may have gone amissing.

The delivery on 8th April was omitted in our former letter, though the quantity noted by Mr. C— for that day is only 9½ gallons.

Mr. C— was not aware of his man supplying the people referred to at 27 Port-Dundas Road. His man supplied a shop next door, and it seems \_\_\_\_\_ and \_\_\_\_\_ (you have \_\_\_\_\_) were acquainted with Mr. C—'s man, and thus got supplied.

We, of course, rely on your keeping private the list of Mr. C—'s customers which we have sent you. It seems some of your staff are going through certain of Mr. C—'s customers telling them to cease taking his milk. This is surely not authorized by you, and is quite unnecessary seeing that all his sources of supply have been found free from any trace of fever, except B——'s, and that has been stopped.

Yours faithfully,  
(Signed) \_\_\_\_\_

Glasgow, 17th May, 1880.

DR. JAS. B. RUSSELL,  
1 Montrose Street.

DEAR SIR,

We have been expecting to hear from you with the information requested in ours of 1st curt., and will be glad now to receive it.

In yours of 28th ult. you undertook to make any investigations that we might think would advantage our client, and if our information is correct, that there has been lately a good deal of fever among people who have certainly not been supplied with milk by Mr. C—, we think you will be quite alive to the bearing such a fact has on the question at issue. We are anxious to be satisfied on the point before your report goes formally before the public.

We are,

Yours faithfully,

(Signed) \_\_\_\_\_

Sanitary Office, 1 Montrose Street,  
Glasgow, 18th May, 1880.

GENTLEMEN,

In the first place I must thank you for the list of dairies and shops supplied by Mr. C—, dated 11th curt. Though no doubt as accurate as in the circumstances it can be, we find it not quite complete, and also in several cases incorrect in numbers of streets and names of parties. It may be well to mention the most important omissions, viz.:—

—, — Castle Street.

—, — Garscube Road.

—, — Grove Street.

—, — Ann Street.

The last is probably the shop given in your list without name as 90 Ann Street.

—, 14 Renfrew Street, we cannot discover.

As to the subject of your letter of 17th May, I have only to say that my duty is to register *every* case of infectious disease the

existence of which is known to me. If your client can inform me of the names and addresses of any persons whatever suffering from enteric fever, or any other "dangerous infectious or contagious disease," I shall be only too glad to receive them, to register them if I am not already aware of them, and, of course, to give them due weight in my investigations.

I am, GENTLEMEN,

Your obedt. Servant,

(Signed) JAS. B. RUSSELL.

14.

DR. JAS. B. RUSSELL,  
1 Montrose Street.

Glasgow, 21st May, 1880.

DEAR SIR,

We were duly favoured with yours of 18th curt.

In reference to the supposed omitted names in the list sent you on 11th curt., we find ——, Castle Street, was overlooked; ——, 97 Garscube Road, is the shop given as at 96; ——, 14 Grove Street, is the same as —— — Grove Street; and ——, 42 Ann Street, is the same as — Ann Street.

We are disappointed you have not seen your way to furnish us with the list of fever patients, seeing the information can be so easily given from the register kept in your office. We think Mr. C—— is quite entitled to receive this information, and ascertain as he best can how many of the patients could have been supplied through him. Although Mr. C—— is aware of some parties who have fever, and who have got no milk from him, his information is more to the effect that fever has been raging in certain parts where his milk never goes. Whether there is any foundation for such rumours could be at once seen, were we furnished with the list asked for. If there is any trouble connected with making it out, we will gladly send a clerk to copy it.

Yours faithfully,  
(Signed) —————

P.S. ——, 14 Renfrew Street, is a private person, but the number should have been given as —. Mr. —— is a smith, and does Mr. C——'s horseshoeing—which explains his taking his milk from Mr. C.

15.

Sanitary Office, 1 Montrose Street,  
Glasgow, 3rd June, 1880.

GENTLEMEN,

I had hoped it would not be necessary to trouble you with further enquiries as to your client, Mr. C——. I observe, however, in the list of dairies appended to yours of 11th May certain indications of a classification into three which I had not noticed. Would you be so good as ascertain:—

1. Whether these three subdivisions indicate the route of three distinct carts. If that is not their meaning, what is it?
2. If so, can Mr. C. give me a general idea of the time and place at which each "rake" of each cart began and ended?
3. Which of these carts supplied the parties at 27 Port-Dundas Road? By the way, you say (11th May) they were served by Mr. C.'s man, who "supplied a shop next door." There is no such shop in your list, nor can we discover any.
4. I see in same letter reference to \_\_\_\_\_'s milk being short. Where does Mr. C. check the quantity invoiced to him from the farmers? At the station or at \_\_\_\_\_?

I am, GENTLEMEN,

Your obedient Servant,

(Signed) JAS. B. RUSSELL.

16.

DR. JAS. B. RUSSELL,  
1 Montrose Street.

Glasgow, 7th June, 1880.

DEAR SIR,

We were duly favoured with yours of 3rd curt.

The divisions in the list appended to ours of 11th ulto. refer to three distinct carts. Each of them made a morning run between 6.30 and 9, and the first and third carts a run through the day between 11 and 3. It was the cart which went to Possilpark that supplied the parties in Port-Dundas Road.

\_\_\_\_\_’s milk was checked at Mr. C\_\_\_\_’s premises in —  
\_\_\_\_\_.

We will now be obliged by your furnishing us with the follow-

ing information, so far as in your possession, viz.: the names and addresses of all known to you who have been affected by the recent outbreak, indicating those who have received their milk either from Mr. C—— direct or through any of the shops supplied by him.

We have expressed more than once a desire to be furnished with this information, and hope now to receive it, seeing the press attendant on your investigations will now be practically over. When sending us this information, we will be glad to know how many cases of enteric fever were in the city throughout the winter.

Yours faithfully,

(Signed) ——————

P.S.—Yours of 3rd curr. would have been answered sooner, but Mr. C—— was prevented seeing us on Friday, and the writer was not in town on Saturday. (Signed) ——.

17.

Sanitary Office, 1 Montrose Street,  
Glasgow, 10th June, 1880.

GENTLEMEN,

Personal illness has prevented me answering yours of 7th curr. more promptly.

I am obliged by your replies to my queries, though I think, on reference to my letter, you will find that you have overlooked one point.

As to your renewed request for certain information, I am sorry to have to repeat the refusal which, in various terms, I have already given on more than one occasion. My inquiry is completed, and the report thereon in the hands of the Local Authority. I regret very much that the patient which, in my letter of 8th May, I begged your client to exercise has been so much taxed by the time spent over this document; but I believe he will recognize that this delay has originated chiefly in my desire to supply him completely with all the information he can desire in this official form.

I am, GENTLEMEN,

Your obedt. Servant,

(Signed) JAS. B. RUSSELL.

P.S.—I cannot close this correspondence without thanking you for your uniform courtesy and attention.

J. B. R.

2. LIST OF DAIRIES AND MILK SHOPS SUPPLIED  
BY MR. C\_\_\_\_\_, ARRANGED IN DISTRICTS,  
WITH REFERENCE TO MAP.

*(See following Pages.)*

## NORTHERN DISTRICT.

Distinguishing No. on Map.	Particulars of Milk supplied by C — (Scotch pints).				If other Supply.	No. Associated Cases of Fever.	REMARKS.
	Hour.	Sweet.	Skim.	Cream.			
1.	7.15 A.M.	4	4	1	Yes.	24	3 daughters ill.
2.	{ 7.15 „	4	4	{ 1	„	9	„
	{ 12 Noon.	2	2	{ 2			
3.	{ 7.30 A.M.	{ 5	{ 8	{ 2	„	2	Butter and buttermilk from C.
	{ 11 „		{ 6	{ ..			
4.	11 „	2	4	1	„	18	„ „
5.	{ 7 „	16	16	2	No.	23	„
	{ 11 „	5	3	1			
6.	7.10 „	2	2	½	„	7	Daughter ill.
							Butter from C.
7.	{ 7 „	4	4	1	Yes.	57	Butter & buttermilk from C.
	{ 11 „	..	6	..			
8.	12 Noon.	2	..	..	No.	...	Ice cream shop.
9.	6.30 A.M.	12	16	4	Yes.	12	Own cows.
10.	6.45 „	10	6	2	No.	2	Butter & buttermilk from C.
11.	7.30 „	1	..	½	„	2	2 sons ill. Ice cream shop.
12.	7.30 „	2½	2½	1	„	4	Son and daughter ill.
13.	{ 7 „	6	6	1	„	14	Butter & buttermilk from C.
	{ 1 P.M.	2	2	..			
14.	6.30 A.M.	2	2	½	Yes.	7	Dairymau and lodger ill, and children sickly.
15.	{ 6.40 „	2	2	1	No.	17	Daughter ill.
	{ 1 P.M.	2	2	..			
16.	7.5 A.M.	11	..	..	Yes.	8	Buttermilk from C.
17.	1.30 P.M.	6	5	1	„	...	Butter & buttermilk from C.
18.	7.20 „	4	2	1	No.	5	Son ill. Butter from C.
19.	11 A.M.	4	12	2	Yes.	5	Buttermilk from C.
20.	{ 6.20 „	4	4	½	No.	6	Son and 2
	{ 11.30 „	4	4	½			daughters ill.
21.	6.10 „	2	2	½	..	3	Daughter ill & all children sickly.
22.	...	...	...	...	{ C.'s own Shop.	17	Dairymaid ill.

## EASTERN DISTRICT.

Distinguishing No. on Map.	Particulars of Milk supplied by C— (Scotch pints).				If other Supply.	No. of Associated Cases of Fever.	REMARKS.
	Hour.	Sweet.	Skim.	Cream.			
1.	{ 7.40 A.M. 12 Noon.	2 1	6 4	1 1	Yes.	13	Buttermilk from C.
2.	1 P.M.	2	2	1	„	1	Son ill.
3.	1 „	2	2	½	„	...	...
4.	{ 8 A.M. 1 P.M.	2 ... ...	2 ... ...	½ 1	„	6	...
5.	11.30 A.M.	3	2	½	„	...	Buttermilk from C.
6.	12 Noon.	...	32	6	„	15	Butter from C.
7.	1.30 P.M.	2	1	1	„	...	Buttermilk from C.
8.	2 „	2	2	1	„	..	„ „
9.	2 „	...	2	½	„	1	Butter from C.
10.	2 „	2	1	½	„	1	...
11.	1.40 „	...	2	1	„	...	...
12.	1.40 „	...	2	½	„	...	...

## CENTRAL DISTRICT.

Distinguishing No. on Map.	Particulars of Milk supplied by C—(Scotch pints).					REMARKS.
	Hour.	Sweet.	Skim.	Cream.	If other Supply.	
1.	{ 6.45 A.M. 11 , ,	16 ... 16	16 ... 2	3 ... 2	Yes.	71 Own Cows.
2.	{ 7.30 , , 12.30 P.M. , ,	4 ... 2	4 ... 2	2 ... 3	No.	3 ...
3.	7.40 , ,	6 ... 6	6 ... 3	3 ... 3	,"	... ...

## WESTERN DISTRICT.

Distinguishing No. on Map.	Particulars of Milk supplied by C—(Scotch pts).					REMARKS.
	Hour.	Sweet.	Skim.	Cream.	If other Supply.	
1.	7.30 A.M.	6	2	1	Yes.	15 ...
2.	8 , ,	2	1	$\frac{1}{2}$	,"	2 ...
3.	8 , ,	1	1	$\frac{1}{2}$	No.	... ...

## RELATION OF CARTS TO SHOPS AND FEVER.

Cart No. 1 serves all Shops in E. District, with 2 and 3 C., and 1, 2, 3, 4, 5, 6, 7, 8 N.—180 Cases associated.

Cart No. 2 serves 1 C., and 9, 10, 11, 12, 14 N.—101 Cases associated.

Cart No. 3 serves 13, 15, 16, 17, 18, 19, 20, 21 N., and 1, 2, 3 W.—75 Cases associated.

3. ANALYSIS OF WATER FROM WELL AT  
FARM.

CITY ANALYST'S LABORATORY,  
138 BATH STREET,  
GLASGOW, 5th May, 1880.

Chemical analysis of a sample of Well-Water from the farm of Mr. \_\_\_\_\_, by Drymen, received on the 1st inst., from Dr. J. B. Russell:—

CONTENTS OF A GALLON IN GRAINS.

Carbonate of Lime, . . . . .	7.98
Carbonate of Magnesia, . . . . .	.80
Sulphate of Lime, . . . . .	2.57
Sulphate of Magnesia, . . . . .	.75
Nitrate of Magnesia, . . . . .	.52
Chloride of Sodium, . . . . .	2.77
Alumina, &c., . . . . .	.42
Silica, . . . . .	.28
Organic and Volatile Matters, . . . . .	1.55
 Total Solids, . . . . .	 <u>17.64</u>

Hardness, degrees per gallon, . . . . .	11.6
Oxygen required to oxidize the Organic Matter, .044 Grs. $\frac{1}{2}$ Gal.	
Ammonia, free or saline, . . . . .	.001
Do., organic or albuminoid, . . . . .	.008
Nitrates, . . . . .	trace.

REMARKS.—This water is clear and colourless, and of moderate hardness. From the proportion of chloride of sodium, the presence of a small quantity of nitric, and a trace of nitrous acid, together with a (comparatively) considerable amount of albuminoid ammonia, which cannot be accounted for by the presence of peaty matter, I am of opinion that it is contaminated, to a small extent, with animal products. As, however, these are almost completely oxidized, and so rendered harmless, the probability of disease arising from the use of the water is somewhat limited.

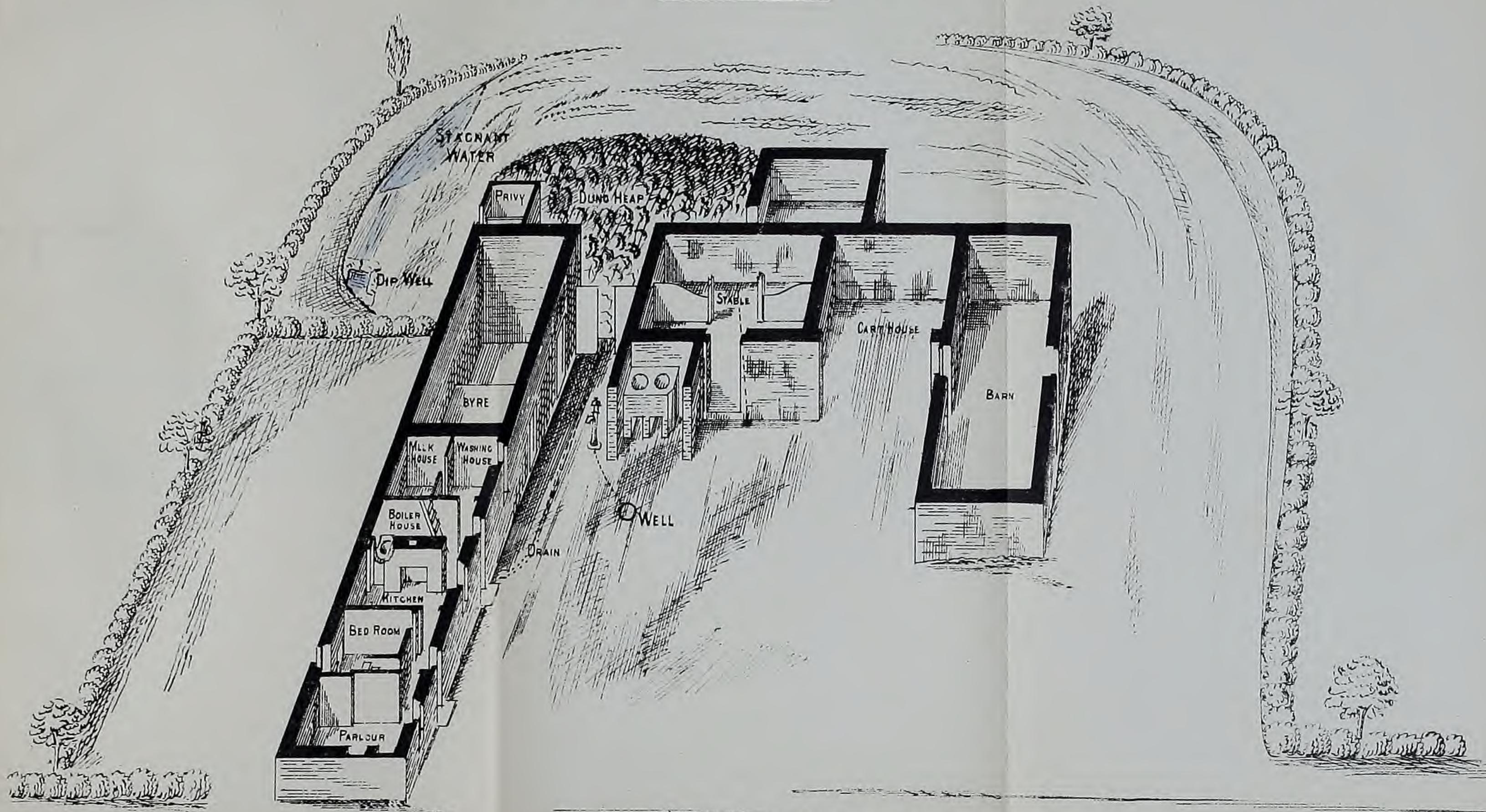
(Signed) WILLIAM WALLACE.

4. TABULAR STATEMENT OF SIZE OF HOUSE, AND SEWER CONNECTIONS, IN FAMILIES INFECTED THROUGH MILK.

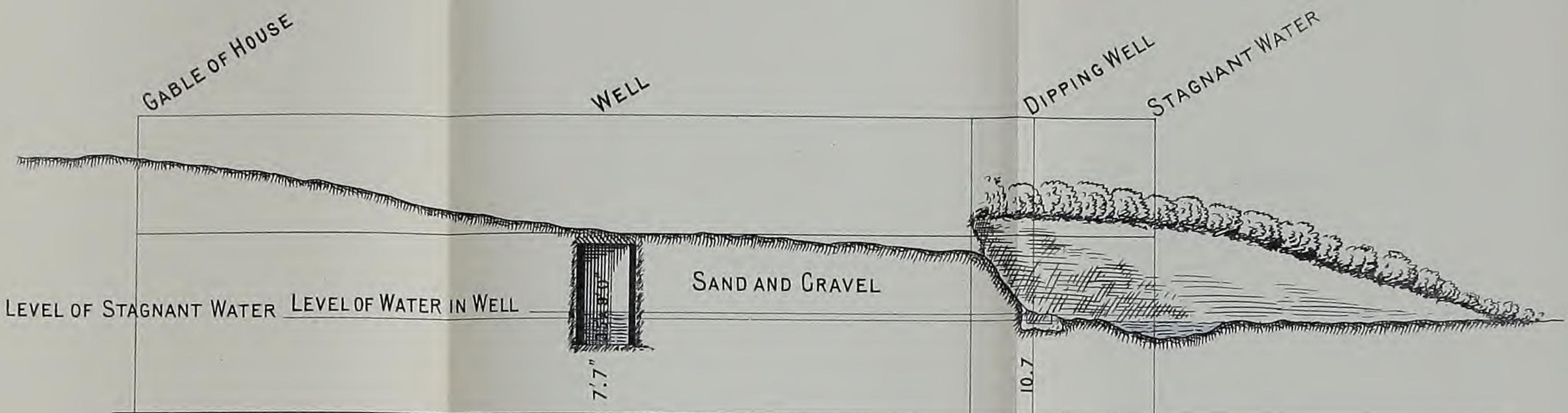
APARTMENTS.	TOTAL.						JAW-BOX.			WATER-CLOSET.			Privy.
	1	2	3	4	5	6	House.	Stair.	House.	Stair.	House.	Stair.	
26	...	...	...	...	...	...	26	20	6	4	6	16	
153	...	...	...	...	...	...	153	141	12	37	62	54	
...	...	53	...	...	...	...	53	52	1	37	9	7	
...	...	...	16	...	...	...	16	16	...	15	1	...	
...	...	...	...	4	...	...	4	4	...	4	...	...	
...	...	...	...	...	...	...	5	5	...	4	1	...	
TOTALS...	26	153	53	16	4	5	257	238	19	101	79	77	



PLAN OF GARTOCHARN FARM, GARTNESS.







SECTION THROUGH WELL



# PLAN OF GLASGOW

CORRECTED TO THE PRESENT TIME.

1 Mile  
In Half Mile Squares





GLASGOW  
UNIVERSITY  
LIBRARY

